

A HITHERTO UNDESCRIBED FRACTURE OF THE ASTRAGALUS. By FRANCIS J. SHEPHERD, M.D., C.M., M.R.C.S. Eng., *Demonstrator of Anatomy, McGill University, Montreal; Surgeon to the Out-Patient Department of the Montreal General Hospital, &c.*

LAST year I exhibited to this Society<sup>1</sup> a specimen of fracture of the astragalus found in a subject in the dissecting-room. Since then I have examined the condition of the astragalus in every subject dissected, and have been fortunate enough to obtain two more examples of the same fracture. From this I infer that it is by no means uncommon. The fact that this fracture is not mentioned in any of the text-books on surgery or special treatises on fractures would easily be accounted for by its only being discovered by dissection; it causes no deformity, and the symptoms it would give rise to during life would probably be obscure. In all three examples the fractured portion is the same; viz., the little process of bone external to the groove for the tendon of the flexor longus hallucis muscle. This process is on the posterior border of the astragalus, and overhangs the os calcis. To it is attached the posterior fasciculus of the external lateral ligament of the ankle-joint, called sometimes the posterior peroneo-tarsal ligament. Judging from the appearance of the fracture, it would seem that the process of bone is torn off by the ligament being put on the stretch in some twist of the foot.

In the first case the fractured portion of the astragalus is somewhat larger than in the other two, and is united to the main portion of bone by fibrous tissue and periosteum. It occurred in the right astragalus of a young man, aged about twenty-five years.

The second example of this fracture also occurred in a young man, and in the right astragalus; but in this there is no fibrous or other union, and the broken process is attached to the posterior peroneo-tarsal ligament. It is displaced slightly outwards, and some strands of periosteum pass between its upper surface and the main bone. The broken fragment is quite movable.

<sup>1</sup> A paper read before the Medico-Chirurgical Society, Montreal, April 14, 1882.

In the third case the whole process is not broken off, but only a part of it. As in the first case, the fragment is united with the main bone by fibrous tissue. This specimen was found in the left astragalus of a woman, aged about sixty, whose bones had undergone fatty degeneration.

In all three cases there was no history, and no deformity was made out before dissection. The joints were perfectly healthy looking.

Supposing that this fracture was produced by some twist of the foot, I performed a number of experiments on the cadaver to endeavour to find out the cause. By flexing the foot, the posterior fasciculus of the external lateral ligament is put on the stretch; the tension is still greater when the foot is flexed and twisted out. In every case where this manœuvre was performed I failed, even when the greatest force was used, to break off the little process of bone mentioned above. If the subject was old, and the bones porous, the tip of the internal malleolus was torn off, and if the action was continued, the fibular attachment of the external lateral ligament. If the subject was a young adult, the tip of the internal malleolus was not broken, but the internal lateral ligament was torn away from it; and if the action was continued, the external lateral ligament was torn away from either its fibular or astragaloid attachment. The process of bone external to the groove for the flexor longus hallucis was never broken off, but always remained intact. Thinking that perhaps the fracture might be caused by jumping from a height, and landing on the heels with the foot flexed, and perhaps twisted out, I, in order to simulate this (imperfectly, I must admit), sawed several limbs across below the knee, and, flexing the foot applied force from above by means of a large mallet. Out of five trials I did not succeed once in fracturing the process to which the posterior peroneo-tarsal ligament is attached, but once fractured the sustentaculum tali of the os calcis. That I was unable to produce this fracture does not disprove that it might be caused by a twist of the foot in jumping or otherwise, as I could but very imperfectly imitate the accident as it would occur during life. The sudden twist of the foot, and the force of the weight of the body, with its great leverage, would be difficult to imitate.

Whilst pursuing my investigations in regard to this subject, I

was struck by the fact that the process on the posterior border of the astragalus varies very much in different bones. In some it is almost absent, whilst in others it is very well marked, sometimes overhanging the os calcis considerably, and measuring three-fifths to half an inch in length. The attachment of the posterior fasciculus of the external lateral ligament also varies in extent; in some cases the whole ligament, or one strong strand of it, is attached to this process; in others it is attached to quite a large portion of the posterior and external border as well. This variety in the process and attachment of the ligament would, of course, influence greatly the production of the fracture. I also noticed, that when the groove for the tendon of the flexor longus hallucis muscle was deep the process was prominent, and *vice versâ*.

May not this fracture account for some cases of sprained ankles which are so slow to recover, and which occasionally leave permanent lameness, or at any rate weakness? In such cases as I have described, it is probable that any motion of the foot (as flexion and twisting out) which puts the posterior peroneo-tarsal ligament on the stretch would be painful. Some may say that this is not a fracture at all, but merely an example of an ununited epiphysis, as is seen occasionally in the acromion process of the scapula. I have thought of this, and discarded the theory for the simple reason that in the astragalus there is only one ossific centre, viz., in the body of the bone. I have never yet seen, in the numerous examinations I have made of the astragalus in new-born children, a special centre for this process. Again, if it were an epiphysis, there would of necessity be a layer of cartilage between this process and the main bone. Dr. Ino Neill, in the *American Journal of Medical Science* of 1849, describes a fracture of the posterior extremity of the astragalus found in a dissecting-room subject. In this case, however, there was great deformity, with dislocation of the anterior portion forwards; the tibia was forced down between the fragments, and greatly separated them. The fractured portion consisted of the whole posterior border, and included the groove for the flexor longus hallucis.

*Note.*—Since writing the above, an astragalus (right) has come into my possession, in which the process on the posterior border has been broken off, and bony union has taken place.